Supplemental materials

MANUSCRIPT TITLE: Distribution, migration and potential risk of heavy metals in the Shima River catchment area, South China

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Table S1 Indices and grades of potential ecological risk.

E_r^i	Grades of ecological risk for individual heavy metal	*RI*	Grades of ecological risk
E_r^i <40	Low risk	*RI*<150	Low risk
40≤ E_r^i <80	Moderate risk	150≤*RI* <300	Moderate risk
80≤ E_r^i <160	Considerable risk	300≤*RI* <600	Considerable risk
160≤ E_r^i <320	High risk	*RI*≥600	High risk
E_r^i ≥ 320	Very high risk		

Table S2 Range and average of physicochemical properties of soil samples

Sampling site	pH	EC ms·m^{-1}	Clay %	Silt %	Sand %	<63μm %	SOM %	Total P %
S1(*n*=5)	6.84 6.43–7.22	17.9 11.9–27.5	1.24 0–4.79	29.6 9.26–39.6	46.3 32.7–79.1	58.0a 22.5–73.1	1.24AB 0.57–1.83	1.08ABC 0.33–1.78
S2(*n*=6)	7.01 6.87–7.41	22.3a 16.4–32.9	1.05 0–3.49	30.4 15.9–38.0	41.4 27.2–65.8	60.8a 32.7–75.3	0.35A 0.10–1.30	0.60A 0.30–1.20
S3(*n*=4)	6.39 6.14–6.85	107 60.0–131	2.95 2.60–3.49	35.4 28.8–38.7	25.7 21.5–36.13	75.7a 64.8–80.0	3.94D 3.38–4.34	2.32C 1.23–3.85
S4(*n*=5)	6.96 6.64–7.26	34.0 19.9–46.2	1.72 0–3.40	25.1 12.7–31.7	50.3 32.9–79.6	52.0a 23.0–68.8	2.69C 1.95–3.07	1.96BC 1.63–2.63
S5(n=5)	7.02 6.48–7.32	61.3b 20.5–102	3.01 1.71–3.97	33.7 21.1–41.4	31.0 11.1–64.0	69.8a 40.0–88.2	1.88BC 0.95–2.61	1.40ABC 0.30–2.80
S6(n=5)	6.35 5.82–6.80	20.3a 19.0–24.6	3.60 2.25–4.84	29.3 20.4–37.4	37.8 15.7–60.7	63.2a 41.9–84.0	1.77BC 1.49–2.41	1.90BC 1.00–2.30
S7(n=4)	6.86 6.31–7.46	10.4 4.98–18.0	2.76 0.28–4.12	37.32 32.2–41.7	26.8 19.6–34.1	75.1a 66.4–80.5	1.02AB 0.24–2.48	0.68ABC 0.25–1.71
S8(*n*=5)	6.59 6.29–7.20	9.14 5.52–12.9	2.96 0–8.09	3514 21.6–52.3	31.8 15.5–52.2	71.2a 45.6–90.8	0.86AB 0.43–1.96	0.59A 0.19–1.35

Data expression: mean (minimum–maximum);
ab exhibited significant differences at p<0.05;
ABCD exhibited significant differences at p<0.01.

Table S3 EC_{20} (%) of R1, R3, R4 and R5 for 15 and 30 min exposure in February

Sample site	Dilution series (%)	15 min PE (%)	EC_{20} (%) (95 % confidence interval)	30min PE (%)	EC_{20} (%) (95 % confidence interval)
R1	25	9.07±2.10^{a}	61.3 (53.4–70.6)	10.4±3.82^{a}	54.9 (47.5–63.2)
	50	12.2±1.75^{ab}		16.3±2.20^{b}	
	100	31.1±1.02^{c}		32.8±2.78^{c}	
R3	25	9.85±1.08^{a}	62.3 (52.6–75.5)	13.3±2.25^{a}	51.1 (40.5–63.1)
	50	16.7±2.49^{b}		19.2±2.80^{b}	
	100	27.5±4.79^{c}		28.6±3.05^{c}	
R4	25	5.23±2.92^{a}	65.4 （58.9–73.1）	9.50±2.55^{a}	46.0 (37.6–54.0)
	50	13.6±1.95^{b}		22.6±3.03^{b}	
	100	31.8±1.53^{c}		39.1±3.32^{c}	
R5	25	8.70±0.88^{a}	58.7 (51.1–67.6)	9.72±0.49^{a}	54.2 (47.2–61.9)
	50	16.8±2.87^{b}		18.3±2.36^{b}	
	100	30.8±±3.50^{c}		32.7±2.95^{c}	

abc exhibited significant differences at p<0.05

As displayed in Table S3, the luminescent inhibition rate (LIR) of sample S1, S3, S4 and S5 decreased with decreasing concentration of water samples. Dilution obviously reduced the water sample toxicity effect on *Vibrio fischeri*. The effective concentration (%) of water samples causing 20 % reduction in LIR (EC_{20}) of all water samples were decreased from 15 min to 30 min exposure time. Consistent with the toxic mechanism of heavy metals study on *Vibrio fischeri,* as reported by Petala *et al*. (2005), the toxicity of Hg, Cu, Cd, Ni and Cr increased significantly with extended exposure time. Content of Zn and Cu in samples, additionally indicated that toxic effect on *Vibrio fischeri* significantly increased, up to one order of magnitude, by increasing contact time from 5 to 25 min. The EC_{20} or EC_{50} of heavy metals thus decreased during the exposure period. EC_{20} of water samples presented in the present study continued decreasing from 15 to 30 min which was corresponded with the effect of heavy metals.

Table S4 Statistical results of potential ecological risks of all heavy metals

Heavy metal	Mean	Standard deviation	Range of potential ecological risk (E^i_r)	Grade of potential ecological risk
As	6.24	2.45	1.85–14.1	Low
Cd	1860	529	894–3550	Very high
Cr	2.16	1.07	0.72–5.84	Low
Cu	26.5	21.4	2.75–84.5	Low – considerable
Ni	10.6	5.18	3.20–28.6	Low
Pb	5.50	3.51	0.43–13.4	Low
Zn	4.28	2.66	0.81–9.34	Low

Reference:

M. Petala, V. Tsiridis, S. Kyriazis, P. Samaras, A. Kungolos and G. P. Sakellaropoulos, *Proceedings of the 9th International Conference on Environmental Science and Technology*, 2005, 1200-1205.